

# Aviation Week

*Including Space Technology*

75 Cents

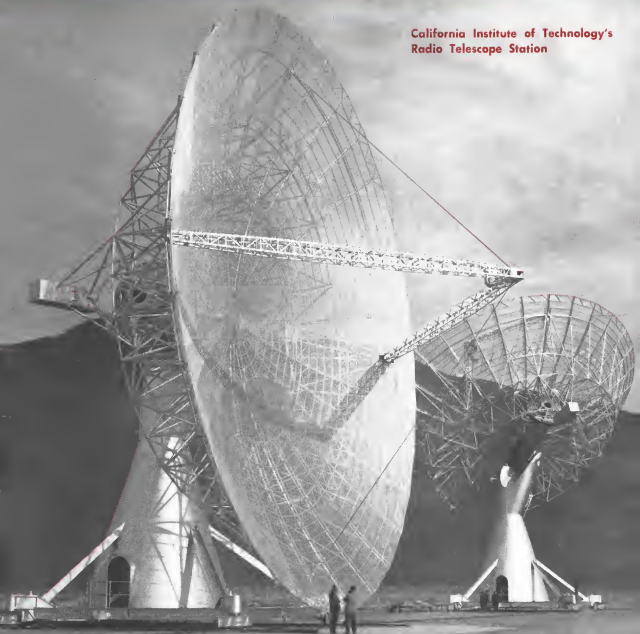
A McGraw-Hill Publication

May 25, 1959

SPECIAL REPORTS:

- Atlas Bases
- Titan Testing

California Institute of Technology's  
Radio Telescope Station



## Kaylock nuts...built to "play with fire!"

America's most powerful Turbojet Engine points its nose at Mach 3. At these speeds, critical components endure enormous stresses. Fasteners must be built to literally *play with fire*. That's why Kaylock high tensile, all metal, lightweight, self-locking nuts—1,050 per unit—were entrusted to fasten components of the compressor rotor of this high performance engine.



From U.S. Mach 3 Turbojet  
seen in use for Air Force 5000  
and now in engines being  
developed for Tomorrow.

### TYPICAL KAYLOCK ENGINE NUTS



K19060



K19061



K19062



K19063



K19064



K19066



R09231



H33-5



H14

Have Fastener Problems?

Send for Kaynar's New 150,000 psi Fastener. Our employees, of course, don't fill in coupons below and mail to:

KAYNAR MFG. CO., INC.—KAYLOCK DIV.  
Box 3801—Tremont, Arizona • Los Angeles 54, Calif.  
Send us **FREE** copy of the new Kaylock 148,000 psi  
Fastener.

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**WHY KAYLOCK?** Because only Kaylock nuts offer advantages every design engineer wants—

**RELIABILITY**—every thread carries its full load. Kaylock nuts have no weakening slots. No built-in "stress risers".

**LIGHTER**—Kaylock Jet Engine Nuts are approximately 50% lighter than old style nuts.

**SMALLER**—Kaylock nuts have smaller envelopes. Use smaller wrenches. Permit bolt center line to be moved closer to load.

**SELF LOCKING**—Resilient, elliptical locking device maintains consistent self-locking torque. No sharp edged slots to cut into threads of mating bolt.



• GUIDANCE  
• NAVIGATION  
• BOMBING

**So Flexible.** It can be adapted to various type missiles, manned or unmanned aircraft—use star-field pattern for matching interceptory guidance—

**So Uncanny.** It can be launched from barren areas where there are no fixed ground reference points and strike a precise target thousands of miles away—

**So Pinpoint Accurate.** It can hit its objective with a single missile—rather than needing a salvo.



—A PRIME CAPABILITY OF

**GOOD YEAR AIRCRAFT**

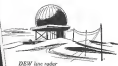
Good Year Aircraft Division, General Motors Corp., Detroit 24, Mich.

Plants in Akron, Ohio, and Littlefield Park, Arizona

**KAYLOCK**   
All metal self locking nuts

KAYNAR MFG. CO., INC.—KAYLOCK DIVISION  
Rm. 3801 and plant, Box 3801, Tremont, Arizona, Los Angeles 54, California. Branch offices, warehouses and representative offices in Wichita, Kansas; New York, N.Y.; Atlanta, Georgia; Canadian Distributors: Altonair Arms, Ltd., Montreal, Quebec.

Circle 10 on Reader Service Card



DESM' line reader



Mobile microphone communications system



Storm detector radar

Electronic products of proven quality,  
efficiency and reliability for the Armed Forces

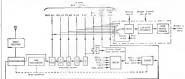
## AVIATION CALENDAR

[illegible]

## available with leading space technology

May 15, 1958  
Vol 73, No 27

## AN INTEGRATED TIMING SYSTEM FOR TRACKING AND CONTROL OF MISSILES



*Schematic diagram of Control Based System*



The Hyman Eastern Integrated Timing System, when used as a central station timer, meets the requirements of most range instrumentation with one comprehensive unit. All pre-programmed times during the shoot, time markers are supplied to recording instruments and switching points are supplied to recording and control instruments located in remote drive stations.

At the heart of the Timing System is the Mycon Elastix Ultra Stable Oscillator with guaranteed stability of one part in  $10^9$  and even greater stability in actual practice. A WWV Receiver corrects for drift error of the time base oscillator over long time periods and a time slide is available with resolution accuracy to 1 microsecond.

Solar or sidereal time is displayed visually and is available for both input to automatic computers and as an index to data being recorded during the test run. Capable of operating anywhere in the world, this system is also suited for astronomical measurements and navigation systems. Write for Bulletin TS-00

### *Teenagers's Timing Spawns . . . Today*

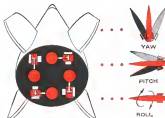


**HYCON EASTERN, INC.**

76 Cambridge Parkway	Dept. W	Cambridge 42 Area
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(Continued from page 5)

- June 21-26—Seventh Pacific General Meeting and Air Transportation Conference, American Institute of Aeronautics and Astronautics, Olympic Hotel, Seattle, Wash.
- June 23-25—Aero Meeting, Aviation Development and Management Assoc., St. Francis Hotel, San Francisco, Calif.
- June 24-26—Second National Symposium Nuclear Indicators, Defense Department, Society of American Military Engineers.
- June 25-26—Third National Symposium on Military Electronics, Sheraton Park Hotel, Washington, D. C. Sponsored in part by Radio Electronic Professional Group on Military Electronics.
- June 25-26—Summer seminar on Flat-top-In-Visioned Properties: Design and Applications, Pennsylvania State University, University Park, Pa.
- July 1-1960—U. S. National Spring Competition, New Haven Hall, New York.
- July 4-10—48th Western Transportation Air Race, Scott Air Force Base, St. Louis, Mo. For information: AET/WWA Transportation, Air Race, Inc., 2511 First Spring St., Long Beach 6, Calif.
- July 16-17—Third National Joint Meeting, Radio Technical Commission for Aeronautics and Los Angeles Section of the Institute of Radio Engineers, Anaheim Hotel, Los Angeles, Calif.
- July 23-24—Quarterly Regional Meeting, Van de Lindt Transport Network, Fairbanks, Alaska.
- July 30-31—Quarterly Regional Meeting, Van de Lindt Transport Network, Fairbanks, Alaska.
- July 30-31—Sixth Annual Symposium on Computers and Data Processing, Denver Research Institute, Stanley Hotel, Estes Park, Colo.
- Aug. 4-8—Second Annual Western Regional Meeting, American Astronautical Society, Sheraton Hotel, Los Angeles, Calif.
- Aug. 5-9—8th Annual Federal General Conference, California Council on the Problems of Aerospace and Space Flight, Stanford University, Stanford, Calif.
- Aug. 15—First National Ultrasonic Symposium, Institute of Radio Engineers Professional Group on Ultrasonic Properties, Stanford University, Stanford, Calif.
- Aug. 18-21—Fourth Electronic Shop & Convention, Institute of Radio Engineers Convention Center, San Francisco, Calif.
- Aug. 24-26—Cosmo Dynamics Symposium, American Rocket Society, Northbrook Sheraton, Evanston, Ill.
- Aug. 31-Sept. 5-1960 Annual Congress International Astronautical Federation, Church House, Westminster, London.
- Sept. 24-29—1960 Congress Engineering Cos. Society, University of California, Berkeley, Calif.
- Sept. 31-1960—Forthcoming Flight Display and Exhibition, Society of British Aeronautical Engineers, Farnborough, England.
- Sept. 15-17-1960 Engine and Operations Symposium, Aircraft Corp., McPhillips, N. Y.
- Oct. 12-15-1960 General Convention of the International Air Transport Association, Tokyo, Japan.



## CompuDyne NOZZLE ACTUATION CONTROL SYSTEMS GIVE ACCURATE IN-FLIGHT DATA—ON THE GROUND!

Missile engineers can get a profitable return on their time and money with a new CDC developed Nozzle Actuation Control System.

Utilizing computer-controlled techniques and high-speed high force electric actuators, the system permits accurate dynamic study of nozzle and associated velocity and the dynamics of the nozzle gasdynamics during static engine tests. With positioner conversion, a typical programmer codes pitch, yaw and roll control corrections as they might occur in the course of actual missile flight. The system's positional capabilities and repeatability are better than one part in 1000.

Delivered in a complete, performance guaranteed package this CompuDyne Control System is one of many dynamic test systems developed by CDC for the aircraft, missile and rocket industries. Included are systems for Rocket Port Control for Sensational Loading of Airframes for Blowdown and Continuous Wind Tunneling. Dynamic in fact, the systems have one thing in common: they have all been built upon a broad base of theoretical knowledge coupled with practical experience in the very specialized field of dynamic control.

For further information on CompuDyne Control Systems for missile and rocket testing write, wire or telephone:

Representatives in Major Cities

## CompuDyne Corporation

(Division of) CDC Global Services, Inc.  
Manufacturers of CompuDyne's Private Control Systems  
401 S. Worcester Road, Monrovia, Penna.

Circle 100



Missile data operations for guided missiles and engines ... with data, timing, tests.

# Arco / Crosley

## From Crosley... Command Receivers for Drones and Missiles

Designed and manufactured by Arco's Crosley Division, Command Receivers are standard equipment aboard most of the nation's missiles. Their job: To receive and act upon instructions from the ground to destroy the missile when its flight path indicates the missile has gone awry.

In a missile configuration, the Command Receiver weighs only 12 pounds, has three channels and incorporates a decoder and power supply in a simple prepackaged package.

A second version of the Command Receiver, employing 12 channels for multi-component motion, is used in high-performance drones and rockets. In such applications, the Command Receiver actuates control surfaces, directs engine operation and opens the recovery parachute—all by radio-received instructions from the ground.

A Product of Crosley Engineering, the Command Receiver has proven itself for the future by the job it is doing in the missiles and drones of today.

For more information, write to: Vice-President, Marketing-Defense Products, Dept. # 30, Crosley Division, Arco Corporation, 1529 Arlington Street, Cincinnati 25, Ohio.



Weighs only 12 pounds, Crosley Command Receivers direct operation of all major missiles, rocket drive recovery.

This is the launch of a series of advertisements dealing with these five alloy steel groups. Through much of the information is elementary, we believe it will be of interest to many in the field, including some of those experienced who may find it useful to review fundamentals from time to time.

## Flame-Hardening Alloy Steels

When the surface of steel is subjected to direct application of flame and heated above the transformation range, then hardened by quenching, the process is known as flame-hardening. Its primary purpose is to surface-harden without affecting core properties. Jets of flame are played directly on the steel, and hardness penetration can be made to vary considerably. Usually in alloy steels this depth will range from 0.03 to 0.12 in., the actual figure depending upon the method of heating and quenching used.

Unlike carburizing, flame-hardening does not involve the absorption of extraneous elements by the steel. There is no alteration of the chemical composition. To put it simply, the steel must have its own self-hardening characteristics, cannot be dependent upon carbonaceous salt baths, gases, etc.

Flame-hardening is not a substitute for the conventional furnace method. Each has its uses. The particular virtue of flame-hardening is that the flames can be directed to localized areas. The furnace, on the other hand, is generally more economical and feasible when parts produced in large quantities must be hardened all over.

Any type of hardenable steel, alloy or carbon, can be flame-hardened, and there will usually be no scale or pitting. The alloy content is the governing factor when determining the quench. In some cases a rapid quench is required; in others, it can be as slow as air-cooling. Tempering presents no problems, for flame-hardened steel can be tempered as if hardened to the same point by other methods.

A list of typical flame-hardened parts would include such familiar items as gear and sprocket teeth, and certain types of cams and rollers, shoe treads, etc. This list is by no means exhaustive; it could include many other parts that often require a localized hardening treatment, especially for wear-resistance.

When seeking information about flame-hardening methods, please feel free to consult with our technical staff. Bethlehem metallurgists will gladly cooperate, and you can depend upon their suggestions. You can rely on Bethlehem, too, as a source of alloy steels, for Bethlehem makes the complete range of AISI standard grades, as well as special-analysis steels and all carbon grades.

BETHLEHEM STEEL COMPANY  
BETHLEHEM, PA.

On the Bethlehem Steel Corporation website  
see only the Bethlehem Steel Corporation  
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**BETHLEHEM STEEL**



First with commercial trans ocean jet service using U.S.-built planes, Pan American has halved flying time between world capitals and other major cities. The 600 mph and up speed at which Boeing 707 jets fly across the world for top reliability of air navigation, radio, other electronic equipment... and all tubes and components.



*Says:* **GE** DEPEND, Performance—Components Overhaul,  
Pan American World Airways System.

## "Our fast jet flights call for the dependable performance 5-Star Tubes like this give!"

"It's the second kind of your watch that ticks off the miles when you travel in Pan American's big jet planes. To maintain our fast schedule, pilots and co-pilots are guided by electronic equipment of the most advanced type now available.

"A 'something extra' guards the reliability of this equipment... G.E. 5-Star Tubes. We've used them for many years in our piston planes. We know they're dependable, know they will outperform and outlast regular receiving tubes.

"They're manufactured for the needs of the new super-wealth air age. So... Pan American employs General Electric 5 Star high reliability tubes in critical sections, to make jet travel still safer, more, more punctual."

See your nearby General Electric tube distributor for 5-Star types! He gives "jet" delivery service! Distributor Sales, Electronic Components Division, General Electric Company, Owensboro, Kentucky.

*Progress Is Our Most Important Product*

**GENERAL  ELECTRIC**

GE-1000



Understandably unwelcome in King Cold's domain . . .

## Heating Blankets and other Waven Heating Elements by SAFEWAY can make your **COLD** problems OLD problems!

Be it the frigid altitudes at which manned aircraft fly, the cold, featureless space domains of missile and satellite, or the icy arctic wastes of DEW Line installations — it's always "winter" somewhere.

Environmental temperature problems common to the land of "winter" beset both land and submarine and hamper the operation of many types of sensitive equipment.

But SAFEWAY dispels such problems by packaging specialized heat for application everywhere. Among the wide variety of heating blankets and wave-wire

heating elements which have been engineered by SAFEWAY to meet exacting specifications are:

- heating elements for heating equipment and for electronic parts, cameras, computers, sensors and batteries — for missiles or aircraft
- heating units for cooled sections
- heating elements for all types of ground support equipment
- defrosting units for industrial and commercial refrigeration
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For your copy of a  
free filled folder,  
please write:

If it has to be heated (and the "it" can be put above anything), you can rely on SAFEWAY engineers to study your problems carefully, and — without any obligation — submit an appropriate recommendation.

# Safeway

HEAT  
ELEMENTS  
INC.

680 Newland Street • Middletown, Connecticut



## WITH MAGNETIC AMPLIFIERS, INC. SOLID STATE-STATIC PROGRAMMER

Programmer equipment which provides a flow of unerring functional commands — accurately spaced in time — is mandatory for successful operation during the critical ascent/descent phase of missile launching.

The Automatic Sequencer shown utilizes a Scan-pack® system and accomplishes precision timing, emitting and verifying 100 Sequential ascent/descent commands as initiated by the Timing Unit, capable of covering down from 999 seconds in 0.1 second intervals with an accuracy of 1% or less. The Sequencing unit picks off the time points, and employs "Set Point" magnetic switches to control 27 functions — at 20 watts output per function. Visual display is provided for function and Response for each function.

Automatic monitoring of each function is accomplished by the Verification Unit. It provides response signals for recognition of compliance for each function, and will halt sequential commands upon non-compliance. The Automatic Sequencer is the latest addition to Magnetic Amplifiers, Inc.'s proven group of Solid State-Reliability Assured Systems.

MOBILE CHECKOUT EQUIPMENT  
SIMULATORS  
STAT-PACK® SWITCHING SYSTEMS  
SPACE AND SUBMARINE AUTOPILOTS

Magnetic Amplifiers, Inc.



## MAGNETIC AMPLIFIERS, INC.

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## Engineering aircraft components to meet the needs of modern speeds

More strength and efficiency with less weight... that's the story of the ever-increasing demands in today's and tomorrow's aircraft performance requirements.

Through vigorous design research, and constant developments in structural concepts and materials, Rohr engineers are keeping up with...and ahead of these demands in the production of aircraft components.

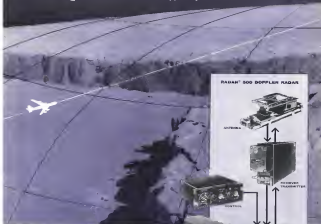
It's another reason for Rohr's position as leader in the design and production of major components for flight.



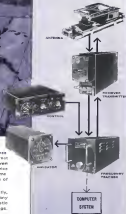
MAIN PLANT AND HEADQUARTERS: ORLA VISTA, CALIF. PLANT: RIVERSIDE, CALIF. ASSEMBLY PLANTS: MINNEAPOLIS, MINN. SA. ASBURY PARK, N.J.

## Reliable RADAN 500

**GPL's new commercial Doppler system**



**RADAN® 500 DOPPLER RADAR**



**RADAN 500** Doppler radar: GPL's all new ARINC system for airlines where the reliability and longevity of service that only 10 years of direct Doppler experience can assure... reliability resulting from 1800 proven designs based on 10 years of product improvement programs. Service feedback on more than 1,500 operational GPL Doppler systems and special attention to the design and maintenance philosophies of commercial airlines.

**SELF-CONTAINED:** Ground speed and drift angle, displayed directly, continuously and accurately — over the poles, over oceans, over any terrain, day or night, good weather or bad — provides a dramatic extension of airline capabilities and important operational savings.

**VERSATILE:** Outputs for navigation computers, flight directors, autopilots, remote indications, and warnings. Write to the world's most experienced Doppler manufacturer for further details on RADAN 500.



AIRCRAFT ENGINE HOUSING



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COMPANY

GENERAL PRECISION LABORATORY INCORPORATED, Passaic, N. J.  
A 50% S. S. of General Precision Corporation







## The Navy's Versatile Vigilante

...an all-weather attack weapon system with unlimited talents for limited war

Versatility means the ability to do several things well—but frequently not to excel in any one of them.

Not so with the Navy's new ASG Vigilante. It can perform a wide variety of missions—yet its sharply increased performance in each would justify building it as a single purpose airplane.

This is the kind of versatility that lightens the high cost of today's 75-percent-electronic weapon systems... provides the right muscle for every mission... turns minimum budgets into maximum air power.

With Vigilante aboard its carriers, the Navy will have

plasma-energy power to control limited war—from breakfast to bedtime.

For the Vigilante will deliver any weapon—bunk or blunderbuss, conventional or nuclear—day or night, in any weather, at any altitude, from any altitude, a full thousand miles from its carrier. No target can hide from its radar eye. It can be used as a spear in limited war... as a bludgeon in all-out conflict.

The Vigilante is now in flight evaluation for the Navy. Designer and builder: the Calverton Division of North American Aviation.

THE COLUMBUS DIVISION OF NORTH AMERICAN AVIATION, INC.

COLUMBUS, OHIO



# for critical welding

## P&H Combination AC-DC Welders

with ON-OFF automatic high frequency

These dual-purpose welders are ideal for super-critical welding because they offer you:

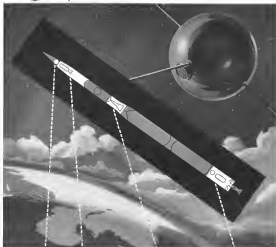
- pre-set gas and water timing
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Get the complete work- and money-saving story. Write for:

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The rigid external skin of the Vanguard Rocket is made of magnesium alloy, 4130. It is plated with gold and silver materials to reflect heat.

The skin is made of 9820, magnesium alloy, 4130. This elevated temperature alloy must withstand temperatures of 500° F. and above.

The skin is formed of 4130 magnesium alloy sheet. Magnesium was selected for its light weight and high strength-to-weight ratio.

4130 magnesium alloy was chosen because it is the world's lightest structural metal.

## LIGHTWEIGHT MAGNESIUM SPEEDS WEATHER ROCKET FOUR WAYS

The shell of the satellite and several parts of the Vanguard Rocket are made of standard magnesium-aluminum and magnesium-thorium alloys. Why not magnesium alloys for this project? Because it is the lightest commercially available metal that could be easily fabricated—yet with a high strength-to-weight ratio and able to withstand elevated temperatures encountered during flight. Magnesium alloys are these demanding requirements as proved by tests conducted by the Naval Research Laboratory in Washington, D. C.

Write today for new illustrated brochure on aircraft materials and alloys. Contact the nearest Dow Sales Office or write to THE DOW CHEMICAL COMPANY, Magnesium Products Sales Dept., Midland, Mich., Dept. MA130255-25.

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

## Canadian Aviation's Fifty Years

Canadian aviation is marking its fiftieth anniversary this year. The first aircraft in Canada lifted off the frozen lake surface at Baddeck, Nova Scotia, on Feb. 25, 1909. This Silver Dart biplane piloted by J. A. D. McCurdy was significantly the product of a joint Canadian-U.S. venture that established a pattern of cooperation that still holds true today. It was in 1907 that Alexander Graham Bell founded the Aerial Experiment Society with Canadian McCurdy and F. W. "Doc" Baldwin and, from below the hood, Glenn Curtiss and Lt. Thomas Selfridge on leave from the U.S. Army.

This was the beginning of the Canadian aircraft industry that today is the third largest industry in the Dominion, employing about 35,000 people and making worth its value of goods and services produced.

Canada contributed its share of top World War I fighter aces. Ten of the Royal Air Force's 27 leading aces were Canadians, and the names of Billy Bishop, Raymond Collishaw, W. G. Barker and Ray Brown entered the legends of air combat in the skies, sea and space.

Between wars, Canadian aviation played a significant role, as it still does, in opening up the natural resources of the vast northern reaches.

The Canadian "bush pilot" with his portcullis and his rocking landing fields of the natural wilderness lakes was the pioneer prototype of all subsequent endeavors to go open inaccessible territory from the air. Today, Canadian aviation operators, many of them little known outside their immediate areas, are performing spectacular jobs in marine fisheries where ordinary land airborne vehicles are obsolete. These jobs include the aerial supply of the DEW and radar Canada under attack, the suppression of the hurricanes blight that invades a multi-billion dollar paper pulp crop in New Brunswick, the construction of a network by air supply to tap the Labrador iron deposits, the construction of electric power lines by helicopter to harness hydroelectric power to aluminum production in British Columbia, and the marine transport of people and goods in all kinds of weather that keeps the Canadian north and west on an operating economy.

### RCAF Growth

During World War II, the Royal Canadian Air Force grew to a strength of 766,000 men and women and set 47 squadrons into combat operations overseas. Today, it provides an air division of jet fighters with NATO and is linked with USAF, Navy and Army units in the North American Air Defense Command, with RCAF Air Marshal C. R. Sherman as vice commander of five joint wings. In backing the air defense of the North American continent from supersonic aircraft and hypersonic missiles, the interests of Canada and the U.S. are inseparably intertwined.

As it often has the case in nature, what was originally scheduled as a year of celebration for Canadian aviation

has also turned into a year of crisis and questions as to the future direction both the RCAF and the industry fast supports it will take.

The free production sector of the Canadian aircraft industry during World War II and its post-war performance have demonstrated its ability to compete successfully in the international market in a variety of ways.

For basic-type transports with short field landing and takeoff requirements, it has been hard to compete in the third Canadian line of Boeing, Otter and Caribou. In the art of adapting both British and American basic designs and adding a touch of its own that gives them distinctive performance, Canada has an impressive post-war record with the Sabre jet fighter series using the Canadian designed and built Orenda engine, the Avro anti-submarine patrol plane and now the CL 44 freighter which recently found a market among U.S. cargo lines.

The Avro Aircraft and Orenda Engine divisions of the British Hawker Siddeley group have struck out boldly on new designs with the Mach 1 Avrocar all-weather fighter, the Avro super and the transonic Taurus tankster. But the Canadian defense budget has found it difficult to support the mounting costs of air, sea, research and development programs in the aerial weapons field. It is indeed fortunate that USAF has continued to support the Avro flying saucer project so that the validity of its principles can be determined by experimental performance.

### Possible Course

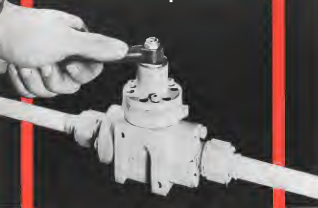
In view of the astronomical costs of modern research and development in the areas of supersonic aircraft, missiles and space vehicles, Canada's worst course may be to develop cooperative programs with both Britain and the U.S., where the results of this basic research, development, design and testing can be applied to fairly well proven hardware adapted to meet Canada's specific defense and transport requirements. And, while U.S. hard work such as the B-70 and defense vessels is purchased for Canada use, it is obvious that Canadian industry must be given an opportunity to compete fairly for the subcontracting and supply business associated with the weapon system. We expect that Canadian industry will have to be considerably more aggressive on an individual basis to make adequate progress in this area.

One striking point in this picture of the aviation business on both sides of the border is the 17½% duty the U.S. imposed on Canadian-built aircraft sold here. There is no similar Canadian duty on U.S. aircraft sold north of the border, and we feel it is very valid reason for the construction of this unreciprocated measure.

Just as 50 years ago U.S. and Canadian citizens joined in the Aerial Experiment Society to lay the foundations of flight north of the border, so today they must both continue to work together for the defense of the North American continent and the continued development of its social and expanding economy.

—Robert Hartz

## Barehand operation



...at -320°F.

## Hydromatics FLO-BALL valves

Hydromatics valves are specifically designed to work at LOX temperatures... with minimum effort. Fast acting, 1/4 turn operation, provides maximum reliability with bubble-tight sealing. Never any freezing problem. Hydromatics exclusive thermal barrier resists bare-handed operation possible at all times.

All FLO-BALL valves incorporate Hydromatics unique 90% flow efficiency diaphragm valve.

From simple manual valves to complex intelligent valves... Hydromatics makes them all. Write for complete information on FLO-BALL valves for high pressure, cryogenic, and corrosive applications.

**Hydromatics, Inc.**

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## WHO'S WHERE

### In the Front Office

Charles E. Bartley, president, Radlett Power, Inc., Miami, Fla., recently acquired subsidiary of The Gulf Oil Co. Mr. Bartley formerly was president of Great Central Fuel Oil Co. Also Frank A. Miron, executive vice president of Radlett Power.

Stephen M. Jenks, executive vice president engineering and research, United States Steel Corp., Pittsburgh, Pa.

G. T. Willey, vice president and general manager of The Martin Co.'s Orlando, Fla., division, succeeding R. G. Uhl, who will remain in that company's corporate staff at Baltimore, Md.

Gordon S. Baughman, vice president in charge of the Military and Industrial Electronic Systems Department, CDS Laboratories, Stroudsburg, Conn.

R. G. Chisum, vice president development planning, Harley-Moore Associates, Torrance, Calif.

Richard T. Orth, vice president planning, Ford McGuffee, Inc., San Carlos, Calif.

Dwight E. Schell, vice president engineering, Kallman Instrument Corp., Elmhurst, N. Y.

Dr. Roy Macklin and Gen. K. D. Nichols USA, et al. of Gulf Oil Corp., directors of Collier Chemical Co., Pittsburgh, Pa.

William F. Sloan, manager of Rem Associates Co.'s Washington, D. C., office.

Wesley Allen Charles F. Cox DSC, et al. will assume new duties in the Washington office in executive advisor to the vice president military relations and military consultant to Mr. Sloan.

Chester Thompson, acting chief of the Office of Public Affairs, Federal Aviation Agency, Washington, D. C.

W. Herbert, senior director of the new Bureau of National Capital Airports.

Dr. Bruce H. Phillips, formerly vice president and director of flight dynamics, has assumed assistant director of research and engineering Department of Defense De Dilling will be in charge of Special Projects, reporting directly to Dr. Herbert F. York.

### Honors and Elections

Major Gen. Joseph D. Collins, director of flight safety research for the Air Force, has received the Missouri Aviation Safety Award for 1959 for having made the year's "most significant and lasting contribution to aircraft operating safety."

John Macfarland, managing director of United Aircraft Ltd., has been elected president of the Royal Aeronautical Society, succeeding Sir Arnold Hall, chief executive of British Satellite, Ltd.

### Changes

David Kline, assistant to A. G. Brown, executive vice president of General Dynamics of General Dynamics Corp., San Diego, Calif. He will coordinate engineering and production methods in General's first operating division. William F. Kline, second Mr. Kline is manager of industrial engineering at Convair Corp. North.

(Continued on page 155)

## INDUSTRY OBSERVER

Watch for no announcement soon of a licensing agreement between Rolls-Royce, Ltd. and the Allison Division of General Motors Corp. for manufacture of the R.R. 141 turbo engine in this country. R.R. 141 is a 12,000 lb. thrust class and is slated for use in the Douglas RB-123 medium-range jet airliner. Biggest U. S. interest in the Rolls-Royce R.R. 141 is for possible application in the Douglas DC-9 medium-range jet transport design.

Martin Co. has designed a burner bearing absolute that would allow studies of new and equipment under conditions similar to those they would encounter at a future time. Outer chamber would simulate space environment, after study of techniques for transferring between hot space and the artificial burner environment.

Swedish development of fueling methods for use in space capsules includes a method of liquidized metals and with products with the consistency of a thick absolute material and carried in a can with a tube attached. Another method of heat, dense and heat has been reduced to the consistency of toothpaste and is carried in a squeezable tube.

Swiss air force technical division on new equipment is expected within the next few months. Evaluation teams of pilots and technicians have just completed testing the Dassault Mirage 3, last of a series of aircraft flown and evaluated. Possible candidates include the Swedish Saab Draken, Boeing F-4E, Grumman F111F, Super Tiger and the Lockheed F-104. Reports are that tests of the Mirage were highly favorable.

Navy is considering the General Electric 2,570 shp. T64 turbine engine as a possible powerplant for an aircraft to fit into its "stealth" concept and provide a platform for the Eagle long-range air-to-air defense missile now under development. T64 also may be used by Navy as an STOL version of the Grumman S2F aircraft plane.

Research control quantities for research and training of space pilots has been designed by the Martin Co.'s Denver Division. Spherical chamber riding on air bearings would house a space pilot and his controls. Chamber could be spun in any direction to learn what degree of disorientation pilot could withstand and still correct his attitude.

Air Force plans to test some of its Lockheed RC-321 Airplane Early Warning and Control aircraft with new higher-power radar to extend the effective range of its SAGE air defense radar for guiding long-range Boeing B-57 interceptors and North American F-105 interceptors. Prospective bidders for the program, known as Airplane Long-Range Link, or ALRL for short, involved in Air Force looking at the project last week at Wright-Patterson Air Force Base.

Watch for more insurance company funds to go into loans to the aviation industry. Significant is that only relatively limited amounts of insurance money are available for industrial lending, and such a loan requires confidence by the long-term insurance lender in the future growth and stability of the field. New loans by insurance companies in the last few months include \$7 million in 5 1/2% notes issued by United Chemical Corp. and \$75 million in the 20-year notes of General Dynamics Corp. Ryan Aeronautical Corp. also has just arranged for approximately \$4 million in long-term financing from an insurance company.

Another entry in the growing list of tungsten metal powder fabrication is the Boeing Section of General Electric Corp. in Portland, Ore. GE process uses wire-cut arc gun to spray tungsten on an intermediate material backed by graphite. Unlike high temperature plasma processes, GE wire arc process can be used to coat tungsten on any material that can withstand 3750°. Company already has sold several tungsten articles which have been successfully test fired.



Figure Precision DMR-500 bearings in use in a computer storage drive

## How to design **BARDEN** Precision into your product

Effective computer storage drive performance depends on extreme accuracy in location of the rotating drive surface as relation to the magnetic pick-off. Maximum disk-to-disk runout is commonly .0001".

The DMR-500 and other **Barden Precision** matched duplex bearings—including race flats, interference and long life demanded by this precision application.

You can design **Barden Precision** into your product by making us **Barden** at the early design stages to help select the bearings you

need to meet your specific demands for precision performance.

Your product needs **Barden Precision** if it has critical requirements for accuracy, torque, vibration, life span or high speed. For less difficult applications, **Barden Precision** bearings can cut your production rates and downtime costs.

From research and design, through quality controlled production, (technical) testing and application engineering, each **Barden Precision** bearing is planned for performance. **Barden Precision** meets not only dimensional accuracy but performance to match the demands of the application.

## THE **BARDEN** CORPORATION

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## Washington Roundup

### Nuclear Plane Decision

Defense Department and Atomic Energy Commission have awarded the Joint Commission of Consultants an Atomic Energy Task Force program for construction of a subsonic nuclear aircraft prototype will soon be submitted to the President and to the committee, probably within a few weeks.

The committee was made late last week during a meeting of key congressional and Pentagon officials. The action was called by members of the Joint Congressional Atomic Energy Committee in view of conflicting statements as to whether the late Donald A. Quarles, Deputy Secretary of Defense, had agreed to submit to the White House a program to develop the nuclear aircraft prototype program and meet forward with construction of two subsonic prototypes. Those attending the meeting were Sen. Clinton Anderson (D-N.M.), chairman of the Atomic Energy Committee; Rep. Melvin Price (D-Il.), chairman of the Subcommittee on Research and Development; Rep. James Van Zandt (D-Pa.), co-chairman of the committee; John A. McGowan, chairman of the Atomic Energy Commission; Dr. Herbert York, Defense Department's director of research and engineering; and Victor R. Lopez, assistant to the Secretary of Defense for atomic energy.

### Financial Storm Clouds

Watch for signs of another financial crisis in the Pentagon thanks to conditions during the summer of 1957 when gross underfinancing of major weapons development and procurement programs forced structural streamlining in the nuclear industry and its related technology. Current indications are that the Pentagon will find itself close to \$300 million short of the funds needed to finance programs scheduled for fiscal 1960, with the real pinch coming in fiscal 1961 when the gap between programs and financing may widen to as much as \$2 billion.

Failure of top Pentagon officials to cut off current programs that are going down the drain, and/or to make more drastic cuts between competing weapons programs is a major cause of the financial squeeze on new development programs. With an election year in 1960 when the fiscal 1961 defense budget will reach the defense point and the attention of both executive and legislative branches of the government, it can easily be deduced from the impending Pentagon crisis into a round of political battles.

### ARDC Streamlining

Streamlining is being laid for a major restructuring of the Air Research and Development Command by its new commander Lt. Gen. Bennett A. Schriever. Major goals will be to consolidate and merge field centers and to reduce the headquarters staff at Andrews Field near Washington. Gen. Schriever has been a strong supporter of the Street report (AW July 14, 1958, p. 74) and his streamlining moves can be expected to greatly follow its major recommendations. Among the key changes are:

- Consolidate Caswell and Rome Development Center into a single research development group.
- Combine the Special Weapons Center at Kirtland AFB

and the Holloman Air Development Center into a single unit with Holloman operating as a detachment of BWCC and playing a supporting role in the ARDC program.

- Consolidate major propulsion research at Edwards AFB, Calif., with existing facilities at Wright Air Development Center and Arnold Engineering Development Center located near Edwards.
- Base operations of the Ballistic Missile Division at Langley, Calif., as the major missile development center with the Atlantic Missile Test Range and Patrick AFB operating in its test division.

### R&D Personnel Shifts

Meanwhile, as a prelude to an organizational change, major personnel changes already have been made at ARDC. Maj. Gen. James Pappas came from the Pentagon as USMC director of requirements to become commander of ARDC on July 23, succeeding Maj. Gen. John Sorenson who is retiring. Maj. Gen. William M. Cantelero, now commander of the Special Weapons Center, will become deputy commander of ARDC for research, succeeding Maj. Gen. Leighton L. Dyer, who goes to the Pentagon as assistant deputy chief of staff for development. Gen. Dyer replaces Maj. Gen. Ralph S. Bradford, who becomes vice commander of the Air University. Other R&D personnel changes are:

Maj. Gen. Victor Hagan, now commander of the Department of Systems Management at WADC, will go to the Pentagon as director of development planning for the USAF, displacing chief of staff for development, replacing Maj. Gen. Leland S. Strickland, who becomes chief of the Carlebach Air Command.

Hagan also will inherit a small portion of the directorate of operations which was formerly under the office of the Deputy Chief for Development. The requirements division staff, along with most of its personnel, was recently assigned to the office of the Deputy Chief of Staff for Operations. It will be headed by Maj. Gen. Bruce K. Halvorsen who is being reassigned from the Tactical Air Command.

Maj. Gen. Charles McCordie, former chief of guided missiles at USAF Headquarters, will move to Kirtland as ARDC Special Weapons Center commander.

### Space Unity

Unification of a sort has come to at least one part of the nation's space program. In the future, all missile and space projects launched by the National Aeronautics and Space Administration will bear the label "United States" (of course any label) at all-operations of what agency handles the launching. Since Mercury capsule missions already have this designation, Lunar probes launched last year were proposed by the services, funded by Advanced Research Projects Agency, launched first in NASA, and launched by the services. These fired by USAF caused only minor label. First Army-launched lunar probe was marked only "NASA." Thus Pioneer IV carried the symbols of both Army and NASA.

Standardizing the designation is one more attempt to demonstrate that the U.S. program is a unified, national effort.

—Washington staff



**Bard Quality Integrator**—a Barden quality control instrument, measures performance characteristics of balls used in Barden Precision ball bearings. Developed by Barden for its own factories' internal use, Bard Quality Integrator has also a standard for precision ball quality.

# New Space Tempo May Increase Support For WS-117

Series of satellites contemplated to circle earth in polar orbit to provide continuous surveillance.

Weightless—increased tempo of space technology, both in the U.S. and Russia, is gaining strong fiscal support for Air Force's WS-117L advanced reconnaissance system, which has been largely frowned thus far on a basis to earth base.

Ultimate application of the WS-117L system, now being developed by Lockheed Annals & Mission and Space Division under protection of the Advanced Research Projects Agency through USAF's Ballistic Missile Data net, encompasses a series of satellites—perhaps as many as a dozen. Each of these will circle the earth in a south-south orbit in a 90-day period for continuous, effective surveillance.

Known by a variety of project code labels, including *Big Brother*, *Red Rover*, *Sentry* and, most recently, *Midas*, this reconnaissance satellite, now evolving out of the most important U.S. system studies in the defense acquisition portfolio in the immediate space spectrum is concerned.

The program has progressed in the past two years from funding on a month to several years, although at times—perhaps last September—there was strong indication that the program would be cancelled. Recently Secretary West has learned, the program involving directed to a one-day period, then was extended to cover another 10-day span.

Now, the situation is beginning with Fiscal 1968, to fund the WS-117L program on a month basis, and observation close to the picture before that funding runs on a quarterly basis would be a promising sign to future support. Definitive follow-on contract is expected to be negotiated this month or early in June.

## Early Port

The early part of WS-117L program, formerly known as *Sentry*/Then, was broken out of the overall program by the Advanced Research Projects Agency and given the designation Project 115, given which is now being carried out to obtain north-south polar orbiting

satellite information from Vandenberg AFB, Calif.

Remainder of the presently planned WS-117L advanced reconnaissance satellite program using the Convair-built A16s as a booster vehicles.

•**Initial firing of the Altitude** WS-117L vehicle, known as *Sentry*/Altitude, probably will be in January, 1968. Under this timetable, the program will overlap that of Project 115, which will develop that all Project 115 vehicles which has deviated from its original time schedule but is being accelerated to include two-month firing. Discrepancy also in an ARPA/BSMD project, with Lockheed's Mission and Space Division as principal contractor. Data assumed in Project 115 satellites will be furnished into *Sentry*/Altitude, which will be a natural follow-on to the Discoverer program.

•**By mid-1968, WS-117L** *Sentry* satellite may be accelerated so that firing will be conducted at the rate of about one a month.

•**Full flight in this area** will be from the Air Force's missile Test Center, Cape Canaveral, Fla., since complete launch facilities for the Altitude booster vehicle are not scheduled to be ready at Vandenberg. Although in time to accommodate the initial phase of the program.

•**Reconnaissance capability** by optics will be attempted initially to reveal the

# For WS-117

area from infrared signals. A record will be made by camera, and the film package will be ejected at a preselected point in the orbit for recovery with parachutes in an equivalent system.

•**Advanced plus configurations** developing the exposed film on the satellite and sending out results electronically, to a ground station. This sophisticated approach although more complicated than the film recovery technique, is more in keeping with the desired system from a satellite with true reconnaissance capability.

•**Advanced sensor development** for the WS-117L program will be known as *Vision* (AV) (Feb. 11, p. 37). Fully, this satellite infrared sensor capability could be adapted for early warning of anti-ICBM complements in order to subsequently extend the alert time for intercept tracking and interception. One limitation of this system is that for true effectiveness, the infrared sensor would be required to focus on the tail end of the ICBM where the best of exhaust emerges.

•**Television camera scanning** is not now included in the *Sentry* scheme.

•**Personnel plan** for the same core to conduct a chemical configuration which would open for viewing, once a first program, but now being changed, based of the open chemical patch

was intended to be used as antenna, but a more, more efficient average want has been devised which will observe the antenna system and the accuracy for the nose cone to open for viewing.

•**Second stage of the WS-117L** *Sentry* vehicle is scheduled to be the Bell Helicopter rocket engine now being used as the second stage of the Project Discoverer vehicle, which was a Douglas-built Thor as a booster. The Bell liquid-propellant engine is advanced version of the powerplant originally designed to supplement the engines for General's B-51 Thunder bomber, will develop an excess of 15,700 lb. vacuum thrust, using conventional dual-chamber and subcooled liquid hydrogen and as the principal combustion.

•**Intermediate nose cone** coupled to the Bell second-stage engine will act as an integral unit composing the satellite. This is the nose cone used for the Discoverer satellite polar orbit.

•**Total weight of Altitude** pre-launch stage plus subcooled hydrogen section—will weigh approximately 5,000 lb., indicating a substantial increase in payload capability over that of the Thor-based Discoverer satellite vehicle.

•**Normal orbiting altitude** will be 300-400 mi. Greater in non-circular orbit will be a difficult goal.

•**Responsibility for building** the satellite will be Lockheed's. The firm

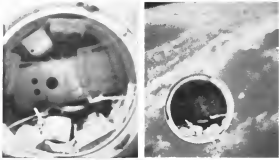
also will have responsibility for checkout and state test of the entire second-stage vehicle at Santa Cruz, Calif.

A number of subcontractors will be associated with Lockheed in the WS-117L program. Philco Corp. will supply ground-based communications equipment.

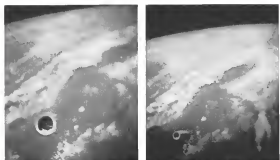
Kathleen Kadi, Co. and Tech. Corp., Palo Alto, are concerned with instrumentation aspects. In addition to having photogeographic capabilities, also work in the field of air-to-air reconnaissance and in reconnaissance retrieval.

Under contract from Air Research and Development Command's Research, N.Y., Air Development Center, Thompson Research Wadsworth is working on a plan for handling over the intelligence from the WS-117L satellite through its Reconnaissance Data Processing Project Office. Subcontracted to Thompson Research Wadsworth is Systems Laboratories Corp., which is concerned with analysis in the field of photogeography to make data received from the satellite. The program includes use of ground equipment which handles motion and image pictures in storage in convenient units. This equipment probably won't be available until the WS-117L program is well under way.

In connection with these photogeographic calculations, orbital studies and attitude control procedures are involved because these are both related to the photogeographic analysis.



**SEPARATION** of an Air Force Thor satellite stage (left) from its Altitude 115 as downrange from Cape Canaveral, Fla., was photographed by a 15 mm ADR Electronics Corp. camera installed in a recovery vehicle data capsule dropped by General 115. Sequence indicates approximate potential of WS-117L. Field of vision decreased over 51 deg. Sequence made it in this order of 90 mi. above (times left) showed end of the booster a few seconds after separation, the booster as it began to drop away while



the recovery vehicle contained on a program ascent to a 500 mi. apogee, the booster falling further back and movement of the earth leaving quite evident and (top right) the booster falling slightly to the right. Land now in the Florida zone and a weather front showing bands of white can be seen. Data capsule, which weighed 45 lb., was instrumentally opened from the entry vehicle and parachuted down; recovery was made by an Altitude 115R range truck about 3,400 mi. downrange and 35 min. after launch.